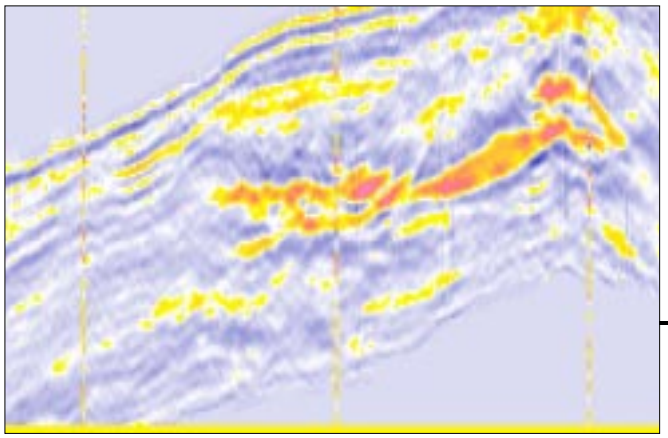


A DOE SUCCESS: *DeepLook* Applying Intelligent Systems Techniques to Subsurface Imaging

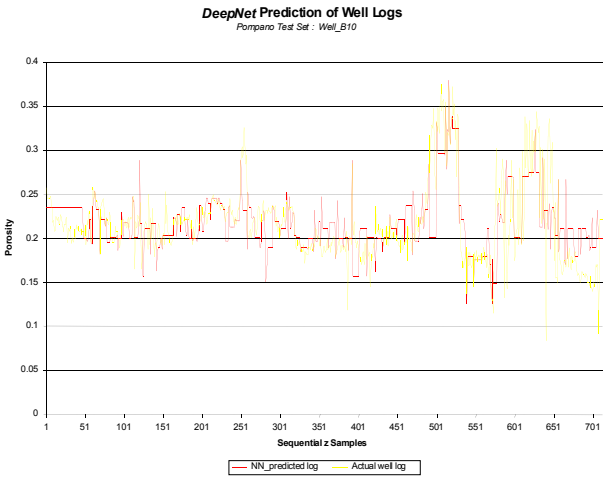
The Project: A primary objective of the Department of Energy is to reduce the Nation's dependence on imported sources of energy. Developing cost-effective methods for producing domestic oil is one of the best ways to reduce oil imports. One such approach, a project called DeepLook, focused on developing a significant advance in techniques for fusing data from many sources (well logs, core samples, seismic images, and oil production) to estimate the location of the 60 billion barrels of remaining oil in discovered oil fields. These fields will be among the primary sources of future domestic oil.

Since its inception, the Center for Engineering Science Advanced Research (CESAR) at Oak Ridge National Laboratory (ORNL) has been developing a broad family of very powerful computational tools for addressing problems related to the operation of robots and other intelligent systems such as learning and multisensor fusion. Many of these tools can be applied to subsurface imaging.

In 1996, a collaboration of eight oil companies (Aramco Services Company, BP Exploration & Oil, Inc., Chevron Petroleum Technology Co., Conoco Inc., Mobil Technology Company, Shell Oil Company, Texaco Group Inc., and Union Oil Company of California), and six oil industry service companies (CGG American Services, Inc., CiDRA Corporation, Landmark Graphics Schlumberger-Doll Research, Smedvig Technologies, Inc., Western Atlas International, Inc.), selected CESAR to conduct DeepLook.

CESAR, the Jet Propulsion Laboratory and Lawrence Berkeley National Laboratory subsequently were funded by this collaboration to work on the data fusion project in June 1997. In this way, DOE laboratory expertise and capabilities were made available to US industry in an area of particular DOE interest.

The technological goal was to use neural networks to predict pseudo-logs throughout a three dimensional seismic volume. Integrated datasets that include both well log data and seismic data (for the same locations as the well log data) were created for several wells. The primary input for the neural nets was acoustic impedance, illustrated above. The output of the neural net was a prediction of porosity. An excellent prediction of porosity for one of the test wells is displayed below.



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